Systematic studies in subfamily Celastroideae (Celastraceae) in southern Africa: two new species of *Gymnosporia* from the Maputaland Centre of Endemism

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Gymnosporia arenicola M.Jordaan and *G. markwardii* M.Jordaan, two new species, are described and illustrated. Both species are largely confined to the coastal sand dunes of northern KwaZulu-Natal and southern Mozambique (Maputaland Centre of Endemism). They are allied to the widespread *G. buxifolia* (L.) Szyszyl. and *G. senegalensis* (Lam.) Loes. *G. markwardii* is more restricted in its distribution and does not occur south of Richards Bay, whereas *G. arenicola* extends southwards as far as Hibberdene, Port Shepstone District. Because of their sympatric distribution and the fact that in both species the stamens in the male flowers and style in the female flowers protrude well beyond the petals, they have often been confused with one another in the past. Material of both taxa was included in the protologue of *Maytenus heterophylla* (Eckl. & Zeyh.) N. Robson subsp. *arenaria* N. Robson. *G. arenicola* is a shrub or small tree up to 7 m tall. It has thick leathery leaves with indurate margins and 3-valved capsules. The verrucose surface of the capsules is a unique character among species of the genus. *G. markwardii* is one of the few suffrutex species in the genus. The leaves are alternate rather than fasciculate and the fruits are small, smooth, dark red or purplish capsules which are always 2-valved.

Keywords: Celastraceae, Celastroideae, endemic, *Gymnosporia*, Maputaland, southern Africa, taxonomy.

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Introduction

Gymnosporia (Wight & Arn.) Hook. f., an Old World genus comprising about 80 species, is confined to Africa, Madagascar and adjacent islands, southern Spain, the near Middle East, Pakistan, India, Sri Lanka, extending to the Far East, Malesia, Papua New Guinea, the Philippines, Taiwan, Queensland (Australia) and the Polynesian Islands. It is sometimes regarded as inseparable from *Maytenus* Molina, a generic concept followed by, amongst others, Marais (1960) and Robson (1965; 1966; 1994). We consider morphological characters such as the presence of brachyblasts and spines (modified axillary shoots), di- or monochasial inflorescence types and flowers which are mainly unisexual (plants dioecious) as supportive evidence for reinstating the genus *Gymnosporia* (Wight & Arn.) Hook. f. (Jordaan & Van Wyk 1999).

The separate taxonomic status of the two new species described in this paper was confirmed during a recent taxonomic revision of the spiny members of the Celastroideae (Celastraceae) in southern Africa (Jordaan 1995). Robson (1965; 1966), however, does not distinguish between these two taxa and refers material of both to *Maytenus heterophylla* (Eckl. & Zeyh.) N. Robson subsp. *arenaria* N. Robson. Both species have male flowers in which the stamens and female flowers in which the style protrude well beyond the petals.

Both new species are endemic or near-endemic to the low-level, sandy coastal plains along the northern KwaZulu-Natal and southern Mozambique coast. This region forms part of a centre of plant diversity, known as the Maputaland Centre of Endemism (Van Wyk 1994; 1996). The climate is characterized by high temperatures and humidity, with no frost in winter. Annual rainfall averages about 1 100 mm along the coast (Van Wyk 1996).

Species descriptions

1. **Gymnosporia arenicola** *M. Jordaan*, sp. nov., *G. buxifolia* (L.) Szyszyl. affinis, sed ramis saepe spinis longissimis armatis; foliis saepe circiter rhomboideis, marginibus interdum induratis nunquam induratis; floribus masculinis staminibus, et femineis stigmate valde exsertis; capsulis rubris, superficie foveolata differt.

TYPUS.—KwaZulu-Natal, 2931 (Stanger): 4 miles N of Umhlanga Rocks Hotel (–CA), December 1959, *Watmough 400* (PRE!, holotypus; K, M, SRGH, isotypi).

Maytenus heterophylla subsp. *arenaria* N. Robson: 21 (1965) pro parte, excl. type; sensu N. Robson: 366 (1966) p.p.; N. Robson & Sousa: 15 (1969) p.p.; Jansen & Mendes: 30 (1991) p.p.

Gnarled straggling shrub or small tree up to 7 m tall, spinescent, glabrous. *Brachyblasts* very short. *Branches* angular and reddish brown when young, becoming terete and grey with age, often with insect galls (thickened areas). *Spines* robust, up to 95 mm long. *Leaves* fasciculate or alternate towards tips of branchlets, glabrous, coriaceous, green, shortly petiolate; lamina rhombic or obovate, 30–56(–70) × 17–35 mm, apex round to emarginate, sometimes shortly acute, base cuneate, margin indurate, revolute, with irregular teeth only in distal half, venation obvious below, midrib yellow in dry specimens, prominent below; petiole 1–2 mm long. *Stipules* subulate, margin fimbriate, ± 1 mm long. *Inflorescence* a dichasium, shorter than leaves; peduncles 4–15 mm long; pedicels 5–8 mm long. *Flowers* 5–9 per cyme, white or yellowish, pentamerous. *Sepals* ± 1.5 mm long, ovate, margin ciliolate. *Petals* 1–3 mm long, triangular, margin uneven. *Disc* 1 mm in diam. *Male flowers* with stamens longer than petals; filaments 3 mm long, arising at base of disc; anthers 0.5 mm long; pistillode small; style short, unbranched. *Female flowers* with style and stigma longer than petals; staminodes shorter than stamens of male flowers; style 1.5 mm long; stigma 3-branched, 1 mm long, spreading. *Ovary* 3-locular; ovules 2 per locule. *Capsules* 3-valved, subglobose, coriaceous, verrucose, 7–9 mm long, yellow to orange-red; styles persistent in fruiting stage. *Seeds* 1–3, ellipsoid, dark reddish brown, 3 mm long; aril yellow, partially covering seed (Figure 1).

Figure 1 *Gymnosporia arenicola*. **A**. Flowering branch ×1; **B**. spine ×1; **C**. young branchlet with leaves in axil and on spine ×1; **D**. male flower ×6. **E**. female flower ×6; **F**. capsule ×4. A & D drawn from *Fokkens 29* (NH); B drawn from *Mogg 28402* (J); C drawn from *Abbott 2674* (NH); E & F drawn from *Nicholas 1730* (NH).

Etymology

The specific epithet is a compound of the Latin *arena* = sand, and *cola* = dweller, referring to the specific habitat preference of this species. We would like to propose the names 'Sand spikethorn', and 'Sandpendoring' as the English and Afrikaans vernacular names respectively.

Diagnostic characters

Hitherto specimens of this species have been identified as *Maytenus heterophylla s.l.*, but it differs in having thick leathery leaves with indurate margins, stamens in male flowers and style in female flowers protruding well beyond the petals, rather than being slightly shorter than the petals, and trilocular capsules with a verrucose rather than a rugose, smooth or ridged surface. *G. arenicola* is a gnarled shrub or small tree with a specific habitat preference, namely coastal sand dunes. The leaves have a yellow midrib which is prominent below in dry specimens. The verrucose surface of the red capsules is unique among species of *Gymnosporia*.

Distribution and habitat

G. arenicola is a common species of coastal sand dunes, occurring along the coast of southern Mozambique through KwaZulu-Natal to Hibberdene (Port Shepstone District). Plants are associated with dune scrub and forest, mostly growing on the forest margins in sandy acid soils, often near wet places (Figure 2).

Representative specimens examined

MOZAMBIQUE

—**1738** (Pemba): Pebane, ± 75 km from Mualama (–AA), *Torre & Correia 15161* (PRE).

—**1737** (Quelimane): Namacurra, ± 26 km from Mcuadala, near camp (–AB). *Torre & Correia 14315* (PRE).

—**1934** (Beira): Cheringoma Coast, near Nyemesembe Fishing Camp, Zuni Estuary (–DC), *Tinley 2681* (SRGH).

—**2135** (Bazuruto Island): Bazuruto Island (–CB), *Mogg 28530* (PRE).

—**2434** (Chidenguele): Zul do Zore, Chidenguele (–CC), *Pedro & Pedroger 1819* (PRE).

—**2532** (Maputo): Maputo (–DC), *Zunguze & Singa 741* (BR).

—**2533** (Macia): Macia (–AA), *Mogg 32643* (J); Xai Xai (–BA), *De Koning 7809* (BR).

—**2632** (Bela Vista): Inhaca Island (–BB), *Mogg 26790* (J, PRE).

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—**2632** (Bela Vista): Kosi Bay (–DD), *Balsinhas 3098* (PRE).

—**2732** (Ubombo): Between Sodwana Bay and Lake Sibayi (–BC), *Buthelezi 466* (NH); False Bay Shore, Hlabisa District (–CD), *Gerstner 4815* (PRE); Sodwana Bay (–DA), *Edwards 122* (NU).

—**2831** (Nkandla): Twin Streams, Mtunzini (–DC), *Abbott 2674* (NH); Siyayi Trail, Mtunzini (–DD), *Abbott 2685* (NH, PRU).

—**2832** (Mtubatuba): Eastern Shores State Forest (–AB), *MacDevette 830* (NH, PRE); Maphelane Nature Reserve (–AD), *MacDevette 223* (NH, PRE); Richards Bay (–CC), *Venter 4896* (PRE).

—**2931** (Stanger): Zinkwazi (–AD), *Moll 2924* (PRE); Tugela Beach (–BA), *Maguire 608* (NBG); Umhlanga Rocks Hotel (–CA), *Watmough 400* (K, NH, PRE, SRGH); Umdloti Beach (–CC), *Pienaar 289* (NH).

—**3030** (Port Shepstone): Isipingo Beach (–BB), *Ward 4251* (NH, PRE); Kelso (–BC), *Du Toit 2419* (NH, PRE); Scottburgh (–BD), *Burger 6* (PRE); Umzumbetshe (–CB), *Nicholson 582* (NH); Hibberdene (–DA), *Nicholson 1201* (PRE).

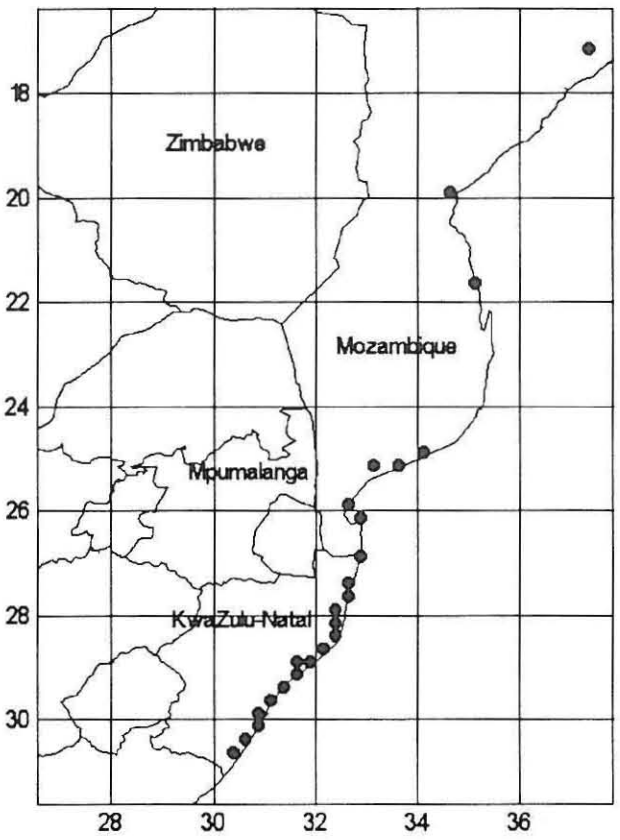

Figure 2 Known distribution of *Gymnosporia arenicola*.

2. **Gymnosporia markwardii** *M. Jordaan*, sp. nov., *G. senegalensis* (Lam.) Loes. similis, sed habitu suffruticoso rhizomatoso; foliis saepe discoloribus; floribus masculis staminibus, et femineis stigmate valde exsertis differt.

TYPUS.—KwaZulu-Natal, 2832 (Mtubatuba): Eastern Shores State Forest, St Lucia (–AB), 6 March 1985, *Nicholas & MacDevette 2138* (PRE, holotypus; NH isotypus).

Maytenus heterophylla subsp. *arenaria* N. Robson: 21 (1965), p.p.; sensu N. Robson: 366 (1966) p.p.; N. Robson & Sousa: 15 (1969) p.p. Type: *Barbosa & Lemos 8514* (LISCI, holotypus; COI, K, LMJ, PRE!, SRGH!, isotypi).

Rhizomatous geoxylic suffrutex with erect, sparsely branched stems, usually not more than 0.8 m tall, rarely up to 1.5 m tall, forming extensive colonies, spinescent or occasionally without spines, glabrous. *Brachyblasts* usually absent. *Branches* angular and green when young, becoming terete and grey with age, smooth. *Spines* short and slender, up to 10 mm long. *Leaves* alternate, rarely fasciculate, coriaceous, glaucous, discolorous when dry, shortly petiolate, glabrous; lamina obovate, 25–42 × 11–32 mm, apex rounded, obtuse, mucronate, base cuneate, margin serrate, venation obscure above, obvious below; petiole 2–3 mm long. *Stipules* very short, subulate. *Inflorescence* a subdichasium, borne terminally and axillary, peduncle flattened, reddish brown, 3–6 mm long; pedicels 2–3 mm long; bracts prominent, persistent, reddish brown, oblong-triangular, margin fimbriate, apex acute. *Flowers* white to cream, produced in profusion, pentamerous. *Sepals* 1.5 mm long, ovate, margin ciliate. *Petals* 2 mm long, oblong, margin ciliolate. *Disc* fleshy, annular. *Male flowers* with stamens longer than petals; filaments 1.5–2.0 mm long, arising at base of disc; anthers 0.5 mm long, versatile; pistillode small, subglobose; style short, unbranched. *Female flowers* with style and stigma longer than petals, protruding; style 1.5–2 mm long; stigma 2-branched, spreading. *Ovary* 2-locular; ovules 2 per locule. *Capsules* 2-valved, globose, coriaceous, smooth, transversely striate, 4–6 mm long, dark red or purplish; styles persistent in fruiting stage. Seeds 2–4, ellipsoid, reddish brown, glossy; aril white, partially covering seed (Figure 3).

Figure 3 *Gymnosporia markwardii*. **A**. Flowering and fruiting branch ×1; **B**. male flower ×6; **C**. female flower ×6; **D**. seed, partly covered with aril ×30; **E**. open capsule ×4. A, C, D & E drawn from *Nicholas & MacDevette 2138* (NH) (type) and *Venter 4896* (PRE); B drawn from *MacDevette 1837* (PRE).

Eponymy

The specific epithet commemorates Mark Ward, a young botanist who was tragically killed in a car accident in 1991. At the time of his death he was employed as regional scientist by the KwaZulu Government and stationed in Maputaland. He was an excellent field botanist who collected many herbarium specimens in northern KwaZulu-Natal, including several new records for the province. As English and Afrikaans vernacular names, we propose 'Maputo spike-thorn' and 'Maputo-pendoring' respectively.

Diagnostic characters

G. markwardii is a rhizomatous geoxylic suffrutex, sometimes without spines, leaves are glaucous and discolorous; flowers have exserted stigmas and anthers. The taxonomic affinities of this species are uncertain. Macromorphological characters such as the mostly alternate rather than fasciculate leaf arrangement, discolorous glaucous leaves, bilocular ovaries, dark red or purplish capsules and seed with a white aril, suggest a relationship with *G. senegalensis* (Lam.) Loes. On the other hand, certain leaf anatomical characters, such as the presence of a hypodermis rather than a multiseriate epidermis (Jordaan 1995), show affinity with species in the *G. buxifolia* group (the former *Maytenus heterophylla* complex).

Distribution and habitat

G. markwardii is endemic to the Maputaland coast (northern KwaZulu-Natal and southern Mozambique) from Bhangazi Lake in the south to Mocuba in the north. It occurs in coastal grassland on acidic, nutrient-poor, sandy soil (Figure 4).

Nomenclatural notes

This species has invariably been confused with the newly described species *G. arenicola*, with which it is sympatric on the sand dunes along the northern KwaZulu-Natal and southern Mozambique coast. The holotype of the name *M. heterophylla* subsp. *arenaria* (*Barbosa & Lemos 8514*) is in fact a specimen of *G. markwardii*. We decided not to use the subspecific epithet *arenaria* (which, in any case, does not have priority outside its rank) for this taxon, because of the confusion surrounding the identity of the two species. Furthermore, since its description the subspecific epithet *arenaria* has never been used in the *Flora of southern Africa* context.

Representative specimens examined

MOZAMBIQUE

—**1636** (Zambézia): Mocuba (–DD), *Torre 4792* (BR, M).

—**1736** (Quelimane): 20 miles N of Quelimane (–DB), *Wild 5878* (SRGH).

—**2435** (Inharrime): Inhambane District, Inharrime, Mangorro, Malamba (–AC), *Barbosa & Lemos 8514* (LISC, PRE, SRGH).

—**2532** (Maputo): Manhica (–BD), *Macuacua 1500* (PRE); between Moamba and Ressano Garcia (–CA), *Torre 2198* (BR, M).

—**2632** (Bela Vista): 26.5 km from Maputo towards Zitundo (–BA), *Correia & Marques 696* (PRE); near Salamanga (–BC), *Lea 2* (PRE); 6 km from Ponta do Ouro to Zitundo (–DD), *Correia & Marques 2070* (PRE).

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—**2632** (Bela Vista): Tembe Elephant Park (–DC), *Ward 1499* (NH); Kosi Bay (–DD), *Strey & Moll 3936* (NH, PRE).

—**2732** (Ubombo): Tembe Elephant Park (–AB), *Ward 2008* (PRE), Manzimhlope Pan NW of Manzengwenya (–BA), *Van Wyk & Potgieter 12200* (PRE); Mbazwana Forest Station (–BC), *Buthelezi 432* (NH); Sodwana State Forest (–DA), *Jordaan 466* (NH).

—**2832** (Mtubatuba): Hluhluwe Game Reserve (–AA), *Hitchins 14* (NH); Eastern Shores State Forest (–AB), *MacDevette 41* (NH); Palm Ridge Farm, Hlabisa District (–AC), *Harrison 291* (NH, PRE); St Lucia, near the coast (–AD), *Van Rhyn 11* (PRU); Lake Bhangazi, Hlabisa District (–BA), *Feely & Ward 22* (NH, PRE); Richards Bay (–CC), *Gerstner 3885* (NH).

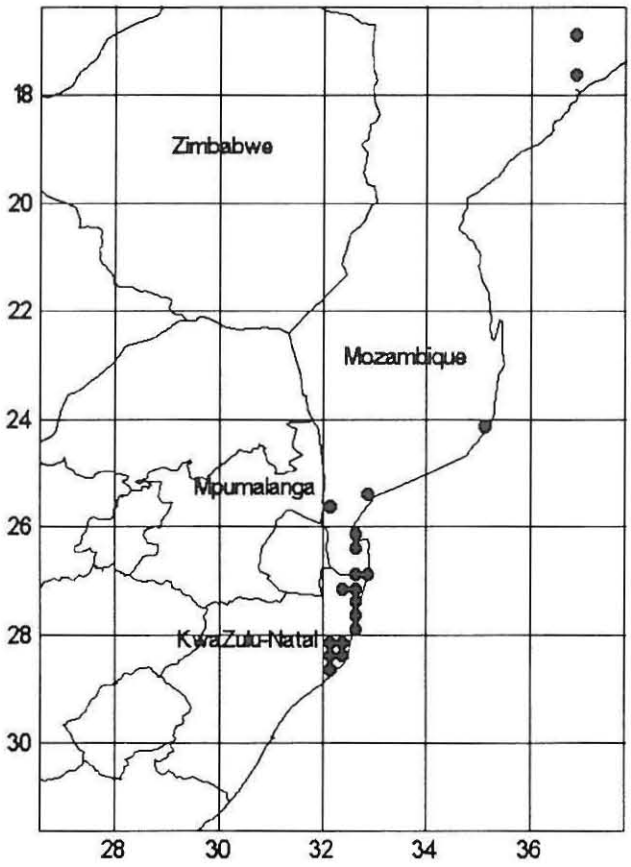

Figure 4 Known distribution of *Gymnosporia markwardii*.

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